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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/785,666 | 02/23/2004 | Raymond Lee Lavoie JR. | 03012US | 2681 |
| 7590 01/25/2006 | | | | |
| Rohm and Haas Electronic, Materials CMP Holdings, Inc. Suite 1300 1105 North Market Street Wilmington, DE 19899 | | EXAMINER MULLER, BRYAN R | | |
| | | ART UNIT PAPER NUMBER | | |
| | | 3723 | | |

DATE MAILED: 01/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|-------------------------------|--|
| Office Action Summary | Application No. 10/785,666 | Applicant(s) LAVOIE ET AL. | |
| | Examiner Bryan R. Muller | Art Unit 3723 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (Pub. No. 2002/0035872) in view of Kurata (2003/0219982).

3. In reference to claim 1, Tsuchiya discloses a chemical mechanical polishing (CMP) slurry (CMP process commonly used for polishing semiconductor substrates) that comprises a thickener in an amount of 0.001-0.05 wt% (overlaps claimed range) that may be Polyvinylpyrrolidone (PVP), 0.0001-5 wt% (within claimed range) benzotriazole as an (corrosion inhibitor) antioxidant (paragraphs 50 and 51), 0.01-5 wt% (within claimed range) citric acid as a (complexing agent) oxidation aid (paragraphs 44-48), 0.01-15% (overlapping claimed range) hydrogen peroxide as an oxidizer (paragraphs 30 and 31), and 0.1-50 wt% and more preferably 1-10 wt% silica abrasive, as discussed supra, with a pH in the range of 3-9 or more preferably 4-8 (overlapping claimed range, paragraph 52) but Tsuchiya fails to disclose that the composition also comprises polyvinyl alcohol. Kurata discloses a CMP slurry and teaches that the addition of a water-soluble polymer in combination with a protective film forming agent to provide an etching-suppression effect, which is a desirable trait, and further teaches

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that the polymer may be polyvinyl alcohol (PVA) in an amount of 0.001 to 0.3 weight% and more preferably in an amount of 0.003 to 0.1 weight% (paragraph 49). Kurata further discloses that the protective film-forming agent may be benzotriazole (paragraph 35). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the Tsuchiya slurry with 0.001-0.05 wt% PVP as a thickener and to add 0.001-0.3 weight % PVA to the slurry that will react with the benzotriazole to provide an etching-suppression effect, as taught by Kurata. It further would have been inherent that increasing the weight ratio of the PVA and PVP would decrease the removal rate of the semiconductor substrate because any change in the weight ratio of the two elements would alter the thickness of the slurry and the etching-suppression effect, which would inherently have an effect on the removal rate. Also the obvious combination of Tsuchiya and Kurata provide a polishing composition that is very similar to that of the applicant's claimed invention, thus it would be inherent that adjusting the ration of PVA to PVP would have the same effect on the composition provided by the prior art as it would on the applicant's claimed composition. The ranges provided are competent rejections based on MPEP § 2131.03 [R-2] - PRIOR ART WHICH TEACHES A RANGE WITHIN, OVERLAPPING, OR TOUCHING THE CLAIMED RANGE ANTICIPATES IF THE PRIOR ART RANGE DISCLOSES THE CLAIMED RANGE WITH "SUFFICIENT SPECIFICITY".

4. In reference to claim 2, Tsuchiya discloses that the molecular weight of the thickener (PVP) is in the range of 10,000-5,000,000 and more preferably 50,000-

2,000,000, which would inherently produce a range of weight average molecular weight that would overlap the claimed range of 1,000 to 250,000 grams per mole.

5. In reference to claim 3, Tsuchiya discloses that the abrasive particles include silica particles (paragraph 27).

6. In reference to claim 4, Kurata discloses that the weight average molecular weight of the thickener (PVA) is in the range of no less than 500 and more preferably no less than 5,000 (paragraph 49), which produces a range of weight average molecular weight that would overlap the claimed range of 1,000-1,000,000 grams per mole. It would have been obvious that the degree of hydrolyzation of the PVA would be at least 20 mole percent because the PVA will be within a fluid mixture comprising a large majority of water (paragraph 26) based on the composition percentages provided for other contents of the slurry.

7. In reference to claim 5, Tsuchiya discloses that the molecular weight of the thickener (PVP) is in the range of 10,000-5,000,000 and more preferably 50,000-2,000,000, which would inherently produce a range of weight average molecular weight that would overlap the claimed range of 1,000-1,000,000 grams per mole.

8. In reference to claim 6, the percentage ranges of PVP and PVA that will be present in the slurry provide a possible ratio range of 10,000:1 (10%:0.001%) to 20:1 (1%:0.05%), which overlaps the claimed range (see MPEP § 2131.03 [R-2]).

9. In reference to claim 7, Tsuchiya discloses a polishing composition comprising 0.001-.05 wt% PVP (within claimed range) with a weight average molecular weight of 500 to 5,000 grams per mole (overlaps claimed range), 0.0001-5 wt% (within claimed

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range) benzotriazole as an (corrosion inhibitor) antioxidant (paragraphs 50 and 51), 0.01-5 wt% (within claimed range) citric acid as a (complexing agent) oxidation aid (paragraphs 44-48), 0.01-15% (overlapping claimed range) hydrogen peroxide as an oxidizer (paragraphs 30 and 31), and 0.1-50 wt% and more preferably 1-10 wt% silica abrasive, as discussed supra, with a pH in the range of 3-9 or more preferably 4-8 (overlapping claimed range, paragraph 52), as discussed supra. Also, as discussed supra, it would have been obvious to include PVA in a range of .001-0.3 weight% (overlapping range) with a weight average molecular weight of 50,000 to 2,000,000 grams per mole (overlaps claimed range) and it would have been inherent that increasing the weight ratio of PVP to PVA will decrease the removal rate, as discussed supra.

15. In reference to claim 8, in view of the obvious alteration to the slurry of Tsuchiya in view of the teachings of Kurata, as discussed supra, it would be obvious to use the modified slurry (of claims 1 or 7) in the method disclosed by Tsuchiya, which provides the steps of applying a polishing composition to a semiconductor substrate and polishing the semiconductor substrate at a given pad pressure and it again would have been inherent that increasing the weight ratio of PVP to PVA would decrease the removal rate, as discussed supra. Tsuchiya discloses an example wherein the pad pressure is 27.6 kPa but it would have been obvious, through routine experimentation, to one of ordinary skill in the art at the time the invention was made to vary the polishing pad pressure in order to achieve a desired removal rate.

16. In reference to claim 9, it would have been obvious that the variation of the weight ratio of PVP and PVA, pad pressure, polishing speed, and slurry supply rate would be able to provide a removal rate within the range of 150 Angstroms/min or less.

17. In reference to claim 10, Tsuchiya discloses a removal rate of 400-1,500 nm/min, which is equivalent to 4,000-15,000 Angstroms/min, which falls within the claimed range of 150 Angstroms/min or more. It further would have been obvious that the variation of the weight ratio of PVP and PVA, pad pressure, polishing speed, and slurry supply rate would be able to provide a removal rate within the range of 150 Angstroms/min or more.

Response to Arguments

10. Applicant's arguments filed 10/12/2005 have been fully considered but they are not persuasive. In response to applicant's argument that the references do not teach the specific benefits of the combination of PVP and PVA, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). The Kurata reference clearly provides motivation to include PVA in the composition of Tsuchiya and even though the references do not provide the same reason to combine the PVP and PVA as the applicant provides, the prior art makes obvious the combination of PVP and PVA in a composition, which, when combined would inherently provide the same advantages as the applicant's composition. In

response to applicant's argument that the Kurata reference teaches that PVA increases copper removal rate, specifically in Table 1, the examiner does not feel that the Kurata reference supports this statement. Table 1 only provides one example of a polishing composition that comprises PVA (example 4) and that particular composition has a lower copper polishing rate than 4 of the six other examples provided. This in no way discloses that PVA increases removal rate and if anything teaches that PVA does decrease the copper polishing rate.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Choi et al (2003/0139127) discloses a CMP slurry with PVP or PVA and teaches a range of weight average molecular weight similar to the claimed ranges and Sachan (6,616,717 and 6,699,299), Wake (6,436,811 and 2002/0037642), Thomas (2002/0019202), Ishibashi (2003/0121214), Dauguet (4,222,747), Sasaki (5,352,277), Costas (6,443,812) and Tsuchiya (6,530,968 and 2001/0005009) all disclose polishing compositions with either PVA, PVP or both and possess other similarities to the claimed composition and Nojo (6,443,811) discloses advantages to providing about 0.01-1weight% of PVA to CMP slurries.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bryan R. Muller whose telephone number is (571) 272-

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4489. The examiner can normally be reached on Monday thru Thursday and second Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph J. Hail III can be reached on (571) 272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BRM BRH
1/18/2006



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